



Q4™ -110 Ton QUADRI-STEER™ Truck Inspection, Maintenance & Repair Manual



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For maintenance and repair of Q4-Trucks, follow all the applicable AAR manuals, including but not limited to those outlined in Appendix 7.1 of this Manual.

Read the entire Manual carefully prior to performing any inspections or repairs.

All inspections and repairs should be performed under safe and proper working conditions.

REVISION STATUS

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1. Introduction – General Information

Q4 QUADRI-STEER™ 110 ton truck (referred to as **Q4™** truck in this Manual), is a three-piece truck which has passed AAR M-976 and was approved by the Association of American Railroads (AAR) in April 2014. Moreover, the Q4 truck is approved for its resistance to loaded hunting, and is designated as **M-976-LH** by the AAR Equipment Engineering Committee (EEC).

This manual is intended to focus on the inspection, maintenance, and repair of the Q4 truck components, and supplements the AAR Field Manual and applicable MSRPs. If there are any questions regarding this manual or applicable AAR rules, please contact Q4 support at Support@Q4TechnologiesInc.com.

The Q4 truck specific components include the side frame, bolster, wedge, friction pad, bearing adapter, guide, and various wear plates. For the maintenance and repair of side bearings, wheels, axles, roller bearings, brake components, and other components that are not covered in this manual, refer to the applicable AAR rules and standards.

2. Main Components of Q4 Truck

The Q4 truck as shown in Figure 1 includes the following components, Appendix 7.2 lists the corresponding part number for each component:

- One (1) bolster (Figure 2). There is one side wall wear plate in each wedge pocket. Ensure they are present. Ensure the vertical liner is applied in the center plate bowl. There are cases where a polymer bowl liner is used instead of the vertical liner.
- Two (2) side frames (Figure 3). There are two (2) column wear plates per side frame. Ensure they are present. The two (2) side frames must be mated (same wheel base plus within one button) per MSRP S-378 for wheel base (distance between pedestal centre lines).
- Two (2) spring groups (Figure 4). There are five (5) D5 outer, five (5) D6 inner, five (5) D6A inner-inner, four (4) B353, and four (4) B354 per spring group.
- Eight (8) wedge assemblies, four (4) left and four (4) right. Each wedge assembly includes a wedge casting and a friction pad (Figure 5). Ensure the friction pad is present.
- Four (4) bearing adapters (Figure 6).
- Eight (8) guides (Figure 6); two per bearing adapter.

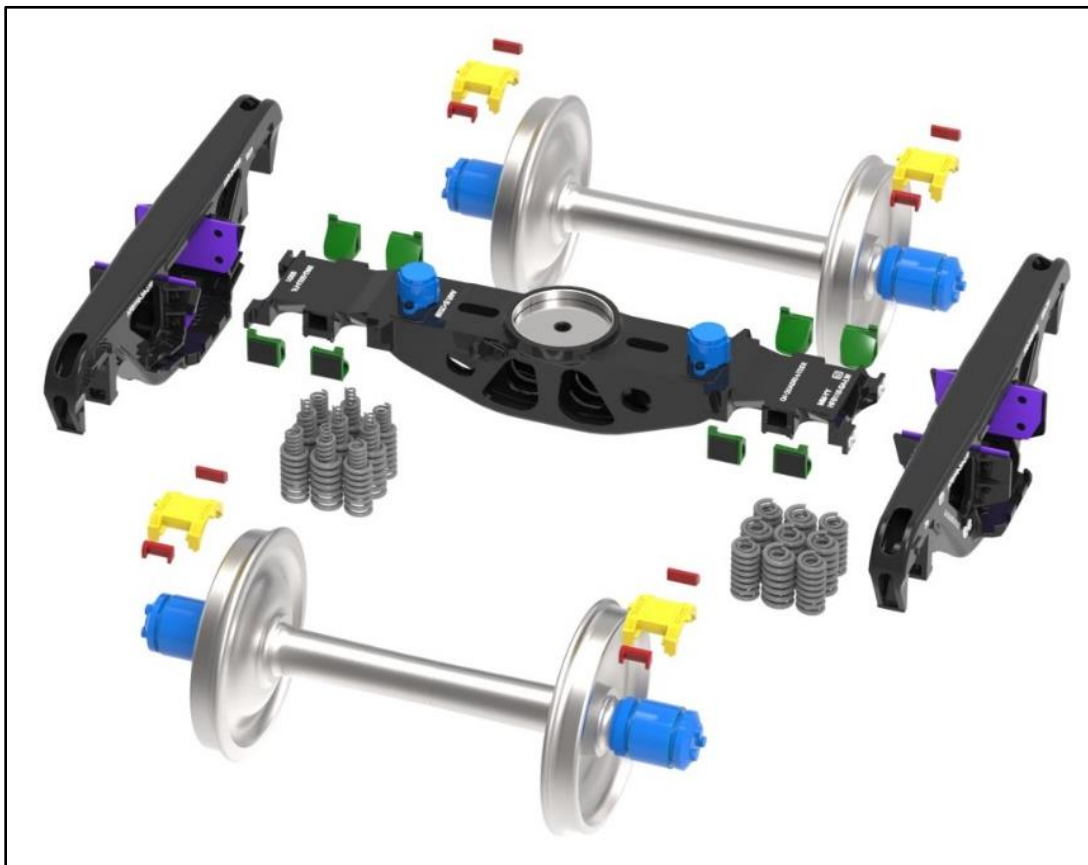


Figure 1: Exploded Q4 Truck View

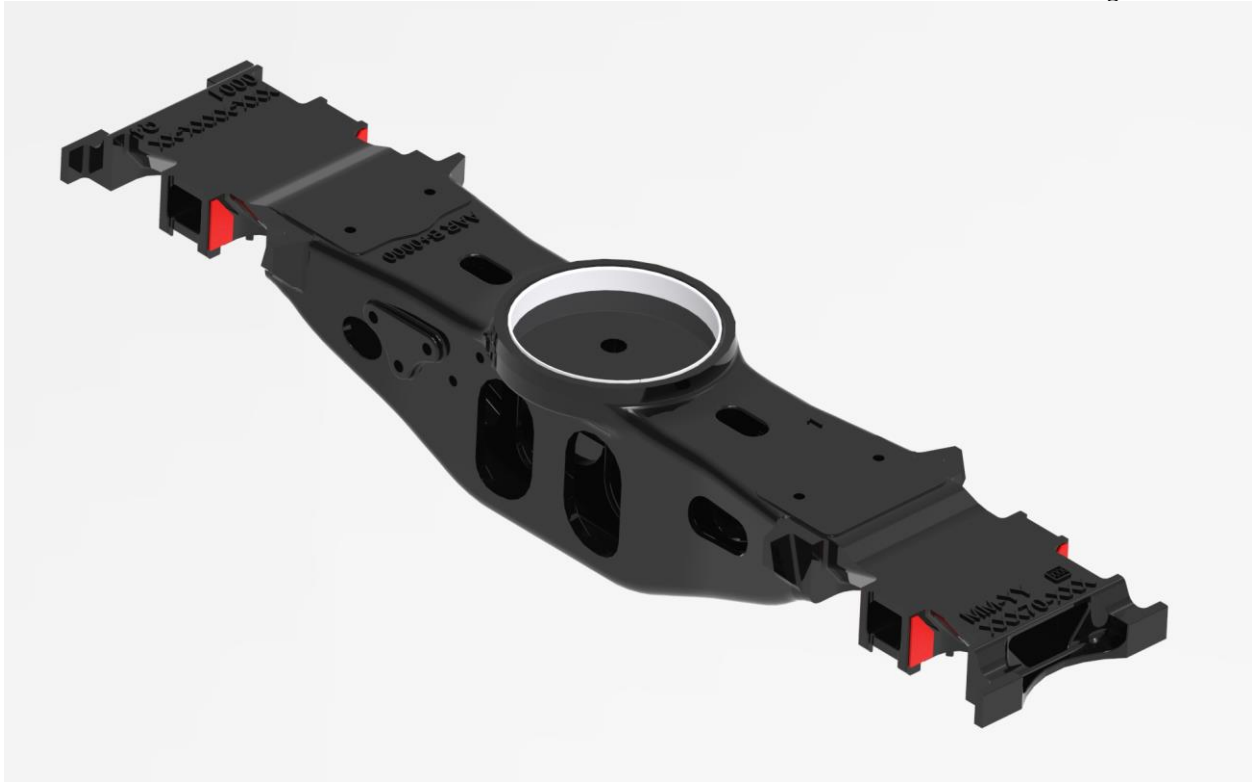


Figure 2: Q4 Bolster



Figure 3: Q4 Side Frame

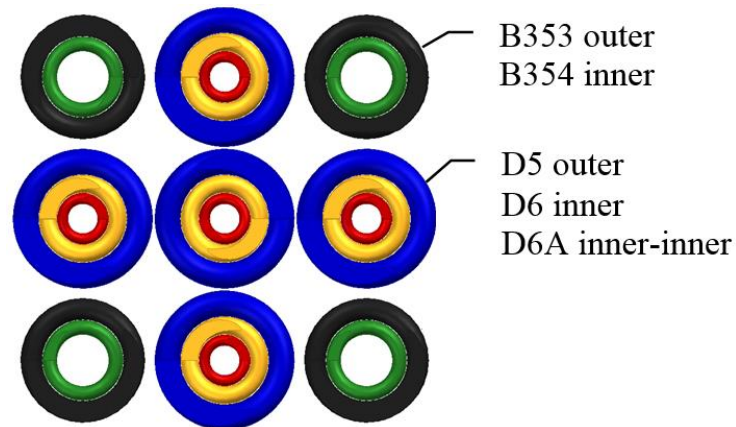


Figure 4: Q4-110 ton Spring Group

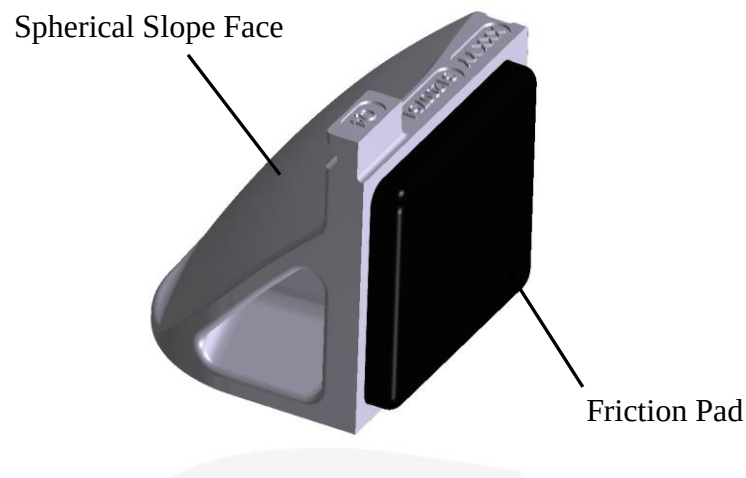


Figure 5: Q4 Wedge with Friction Pad Applied

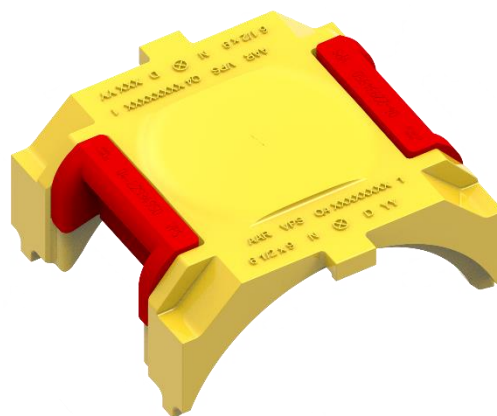


Figure 6: Q4 VPS™ System; the Bearing Adapter and Guides

3. Q4 Truck Assembly Procedure

3.1. Wedges and Spring Nest Assembly

1. Put two side frames in place.
2. Bring the bolster in between the two side frames.
3. Locate the ends of the bolster through the side frames openings (Figure 7).
4. Lift the bolster inside the side frame openings until it contacts the side frame spring roof (Figure 8).

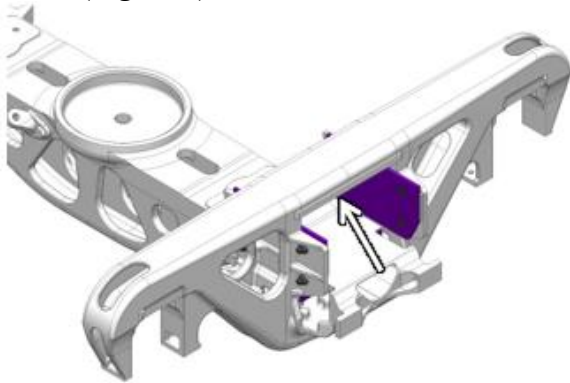


Figure 7: Locating Q4 Side Frame Opening

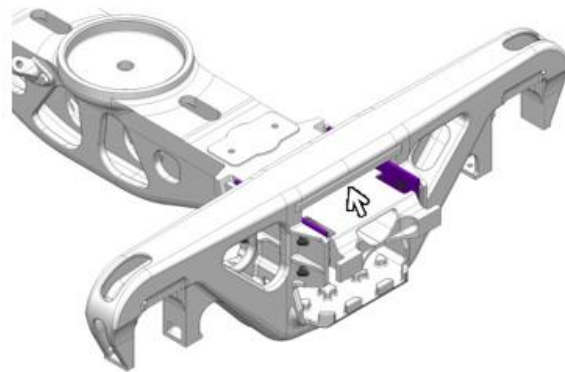


Figure 8: Locating Bolster End in Q4 Side Frame Opening

5. Prepare one spring group for each end of the bolster (Figure 9).

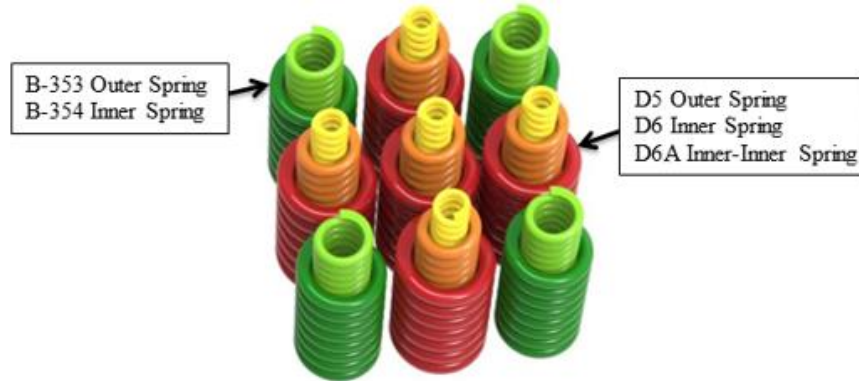


Figure 9: Q4 Spring Group

6. Put the first inboard wedge inside the inboard bolster wedge pocket; using the handle on the top of the wedge, lift the wedge all the way up inside the pocket.
7. Install the snubbing springs under the wedge and drop the wedge into place. Ensure the wedge is seated properly in its location.
8. Repeat Steps 6 and 7 for the second inboard wedge (Figure 10-1).
9. Install one set of main springs between the two installed inboard wedges.
10. Install the second row of main springs (Figure 10-2).

11. Install the outboard wedges similar to the inboard wedges (Figure 10-3).
12. Install the last set of main springs between the two outboard wedges (Figure 10-4).
13. Ensure all the wedges and springs are seated properly (Figure 11).
14. Lower the bolster; ensure there is no binding between springs.

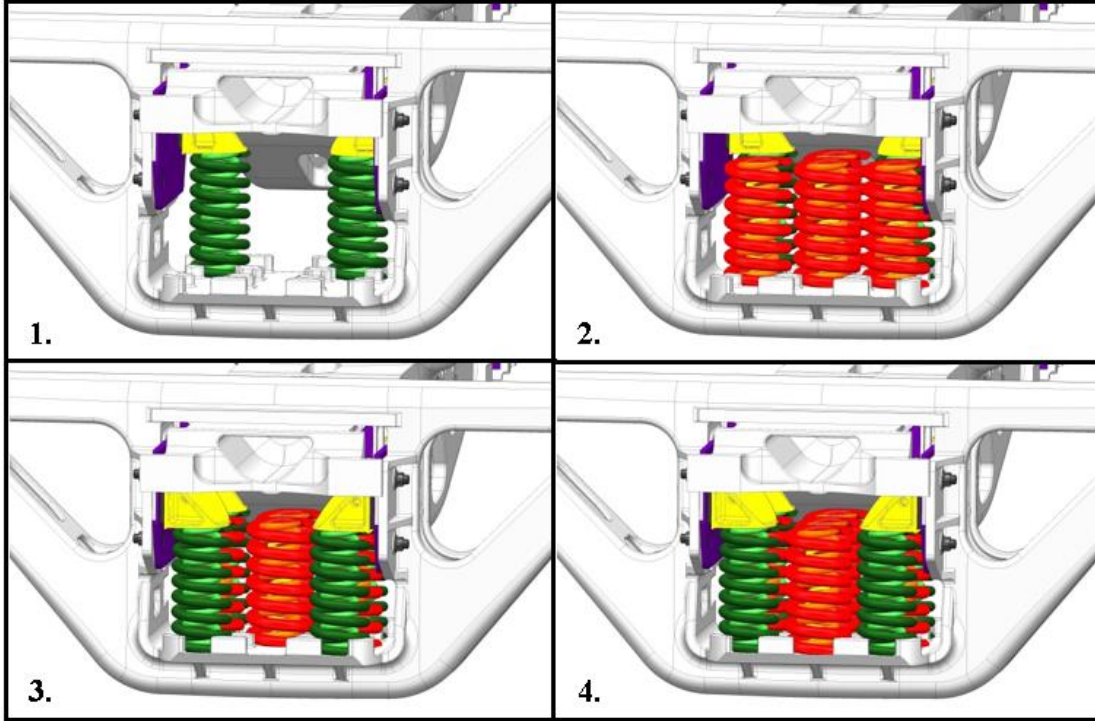


Figure 10: Wedge and Spring Nest Assembly Order

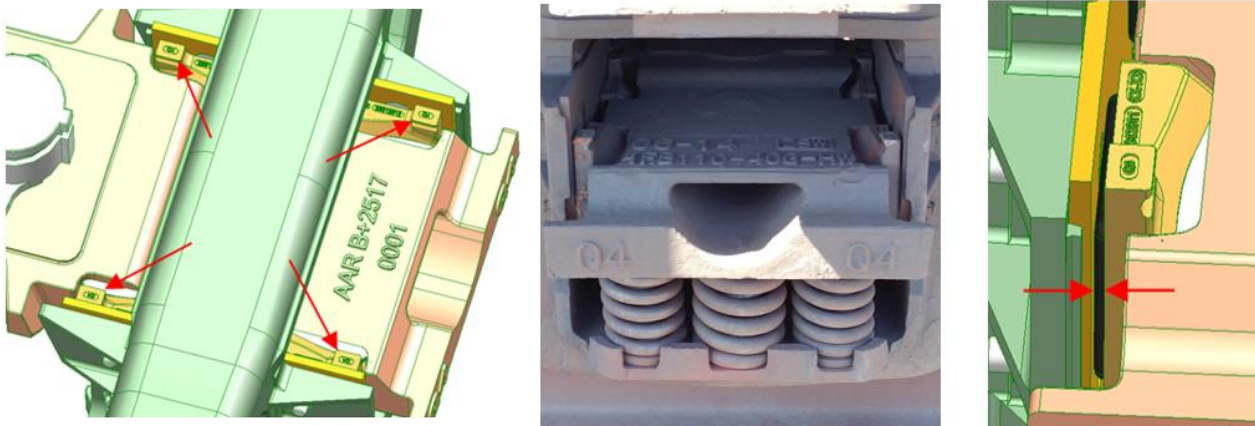


Figure 11: Proper Installation of Q4 Wedges and Springs

3.2. Q4™ VPS™ System (Bearing Adapter and Guides) Assembly

1. Apply two guides over the thrust lugs.
2. Lift the bearing adapter between the two guides all the way up in the pedestal pocket until the top of bearing adapter contacts the pedestal roof (Figure 12).
3. Use a bungee cord or equivalent to keep the bearing adapter in the pedestal pocket.
4. Repeat Steps 1, 2, and 3 for all corners of the truck.

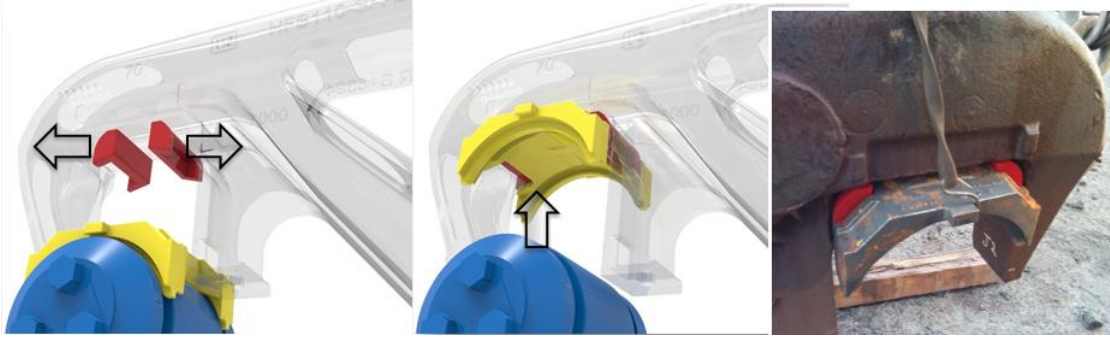


Figure 12: Sequence of Installing Q4 VPS System (Bearing Adapter and Guide)

5. Lower the truck partial assembly over the two wheelsets.
6. Ensure that the bearing adapters are seated properly over the roller bearings and remove the bungee cords or equivalent (Figure 13).
7. Perform complete Q4 Truck Assembly Checklist (Section 3.3).

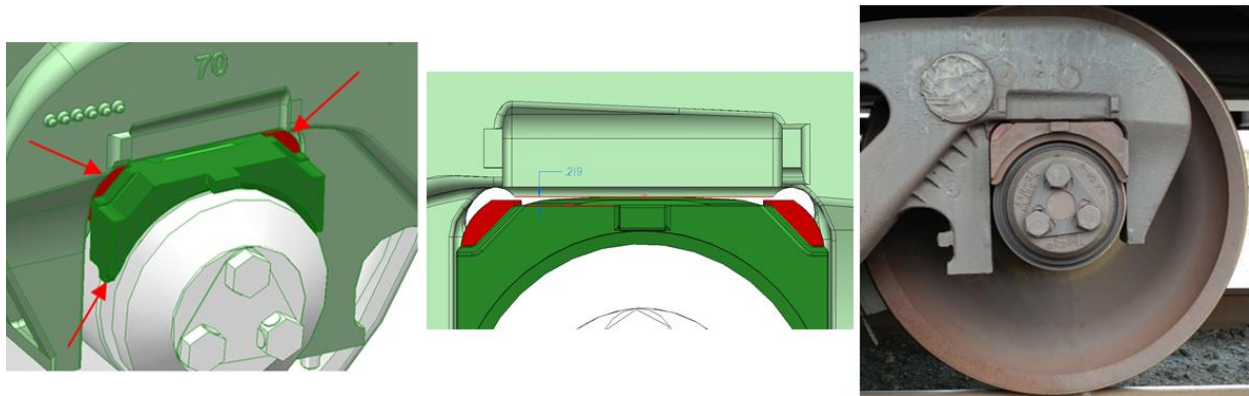


Figure 13: Proper Installation of the Bearing Adapter and Guides

3.3. Q4 Truck Assembly Checklist

	1. The spring group of the Q4-110 ton truck has a 3 by 3 pattern. All springs must be present and properly seated. There should be an outer and inner spring under each wedge, and an outer, an inner, and an inner-inner spring in all other locations (Figure 9)
	2. Ensure springs are vertical and there is no binding between adjacent springs.
	3. It is recommended to measure spring heights at all four corners of the car in the empty condition, ensure the measured values are within 1/4" of each other.
	4. All wedges must be present and have the proper orientation. To confirm the correct orientation, check that the raised tabs on the wedges are away from the side frame centerline (Figure 11).
	5. All wedges must have a friction pad present. The pad separates the main body of the wedge casting from the column wear plate (Figure 11)
	6. All bearing adapters must be properly seated on the roller bearings with both bearing adapter shoulders in the bearing grooves (Figure 13).
	7. Two guides must be present with each bearing adapter. The guides must be properly seated in the bearing adapter and around the thrust lugs (Figure 13).
	8. The bearing adapter crowns must contact the pedestal roof (Figure 13).
	9. Side frames of a truck must be mated (same wheel base plus within one button) per MSRP S-378 for wheel base (distance between pedestal centre lines).
	10. The bolster must be approximately centered between the two side frames, and the opening between the outboard bolster stops and side frame gibs are approximately equal on both ends.
	11. The bolster, side frames, and bearing adapters must be free of any physical damage, cracks, nicks, or gouges deeper than 1/16", as per AAR Specification M-214 .

4. Q4™ Truck Disassembly Procedure

For the full disassembly of the Q4 truck, follow the sequence provided in Section 3 of this Manual in the reverse order. However, it is important to consider that in order to change any individual spring, wedge or bearing adapter, there is no need to disassemble the whole truck.

4.1. Wedges and Spring Nest Disassembly

Individual wedges may be removed and replaced by lifting the end of the bolster off the springs and wedges until it contacts the side frame opening roof. Secure the bolster in this position. Remove the springs in the reverse of the assembly order shown in Figure 10. Holding the wedge handle when removing wedge springs will prevent the wedge from dropping unexpectedly.

4.2. Q4™ VPS™ System (Bearing Adapter and Guides) Disassembly

The bearing adapters and guides may be removed by separating (lifting) the end of the side frame from the roller bearing. Be aware that the bearing adapter may cling to the side frame, and can subsequently drop unexpectedly. Use a bungee cord or equivalent to keep the bearing adapter in the pedestal pocket (Figure 12) before lifting the side frame. Remove the bearing adapter and then both guides.

5. Q4™ Truck Inspection and Repair

5.1. Side Frame

All areas of the Q4 side frame are to be inspected and repaired as per AAR Field Manual Rule 48 and AAR Specification M-214 and what is covered in this manual.

5.1.1. Pedestal Roof

The pedestal roof of the Q4 side frame (Figure 14) may experience some wear in the center of the pedestal roof. To check the wear, use a wire brush to remove any debris and surface contamination and place a straight edge diagonally across the pedestal roof and apply a 1/16" thick by 1/2" wide No-Go shim between the pedestal roof and the straight edge. If the shim is able to fit, the pedestal roof is to be repaired by grinding flat as specified in AAR Specification M-214 and Standard S-327. If the pedestal roof reaches the grinding limit of S-327, the side frame must be replaced. The pedestal roof of the Q4 side frame is not to be repaired by applying a pedestal roof wear liner, as the Q4 bearing adapter is not compatible with any wear liners.



Figure 14: Side Frame Pedestal Roof Wearing Surface

5.1.2. Column Guide

The Q4 side frame column guides (Figure 15) may also experience some wear when making contact with the gibs on the bolster. To check the wear, use a wire brush to remove any debris and surface contamination and apply a straight edge across the wearing faces of the column guides. If a 3/16" No-Go shim is able to fit at any point along the column face, a repair must be performed. The Q4 side frame columns are to be repaired by weld build-up and ground flush as specified in AAR Specification M-214. If a 1/4" No-Go shim is able to fit at any point, the side frame must be replaced, as building up of worn column guides is only allowed if the wear is 1/4" or less.

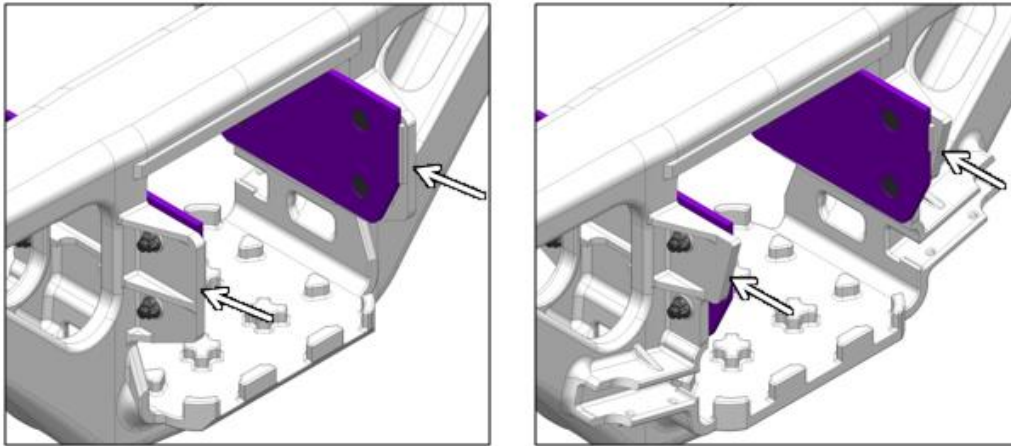


Figure 15: Side Frame Outboard (left) and Inboard (right) Column Guide Wearing Surfaces

5.1.3. Side Frame Column Wear Plate

The wear criteria for the side frame column wear plates (Figure 16) is covered by AAR Specification M-214. This wear plate is expected to wear very slowly, as the wedge friction pads contacting it are non-metallic. If a replacement is needed for the side frame column wear plate, replace with in kind components only.

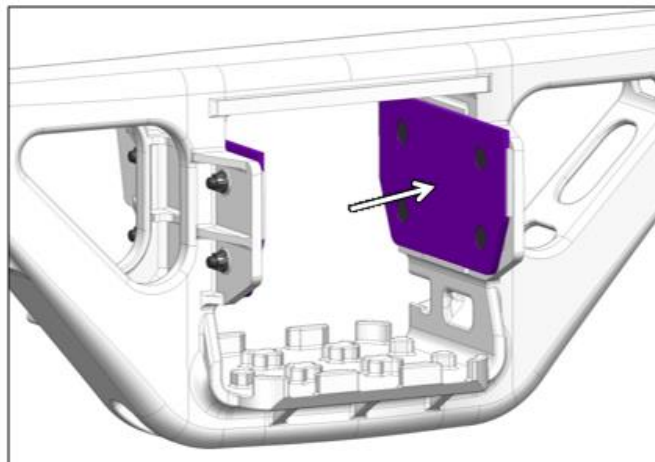


Figure 16: Side Frame Column Wear Plate

To apply the column wear plate, follow the requirements of AAR Specification M-210 and Standard S-3003. However, the Q4 column wear plate application has some differences to those in AAR rules. The rule that a 1/32" x 1/2" feeler gauge must not go between the wear plate and the casting more than 1/2" is to be disregarded in the recessed region of the side frame column face only. There is also a specific bolt torque sequence for the application, which is described in Figure 17. Reference Section 5.5.1 of this manual for the fasteners needed to apply the column wear plate.

Bolt Torque Sequence:

- 1) Snug each bolt in the sequence shown in Figure 17. Do not break the bolt head off during tightening in this step.
- 2) Tighten each bolt until the bolt head breaks off, in the sequence shown in Figure 17.

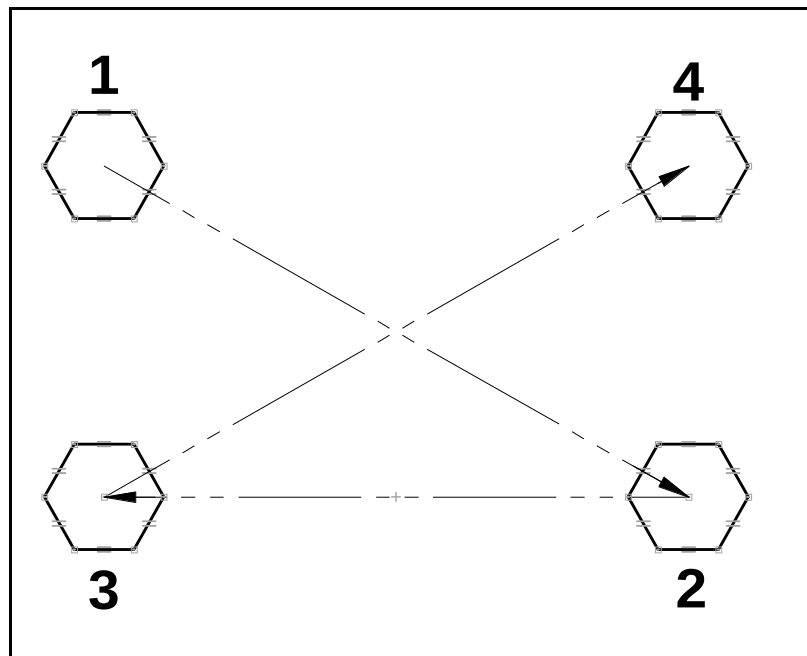


Figure 17: Side Frame Column Wear Plate Bolt Torque Sequence

5.1.4. Side Frame Thrust Lugs

The inboard side of the side frame thrust lugs may wear due to contact with the bearing adapter guide shoulder (reference Section 5.4.1). This wear does not affect the performance of the passive steering system. It is only recommended that any surface upset (battered or rolled by wear) on the thrust lug be ground and blended with the surrounding surfaces whenever servicing the adapter. This repair also applies to future AAR M-214 reconditioning requirements.

5.2. Bolster

All areas of the Q4 bolster are to be inspected and repaired as per AAR Field Manual Rule 47 and AAR Specification M-214, and what is covered in this manual. Note that the Q4 bolster uses a 16" diameter bowl and has a nominal bowl depth of 2" without the horizontal wear liner installed.

5.2.1. Wedge Pocket

Each Q4 bolster wedge pocket has two contacting surfaces: the side wall wear plate and the slope face (Figure 18). There are four (4) wedge pockets on each end of the Q4 bolster.

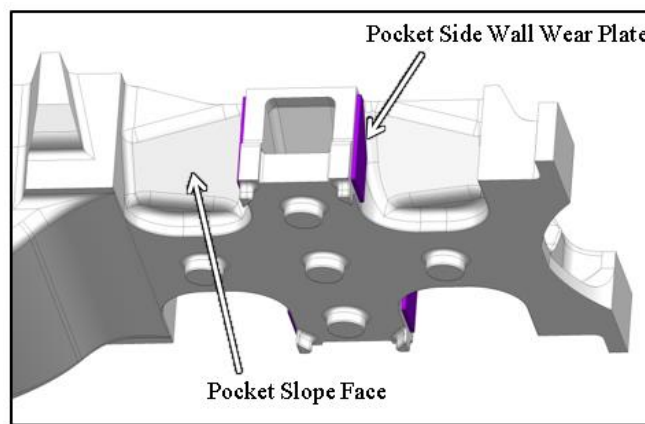


Figure 18: Q4 Bolster Wedge Pocket Wearing Surfaces

The pocket slope face is flat. Use a wire brush to remove any debris and surface contamination and apply straight edge gauge Q4-1780 diagonally across the pocket slope face and apply a 1/16" thick by 1/2" wide No-Go shim between the gauge and the pocket slope face (Figure 19). The gauge should rest on the flat face, and not contact the radii of the bolster wedge pocket. If the shim is able to fit, repair the bolster wedge pocket by using weld build up and grinding flush to restore the pocket slope face.

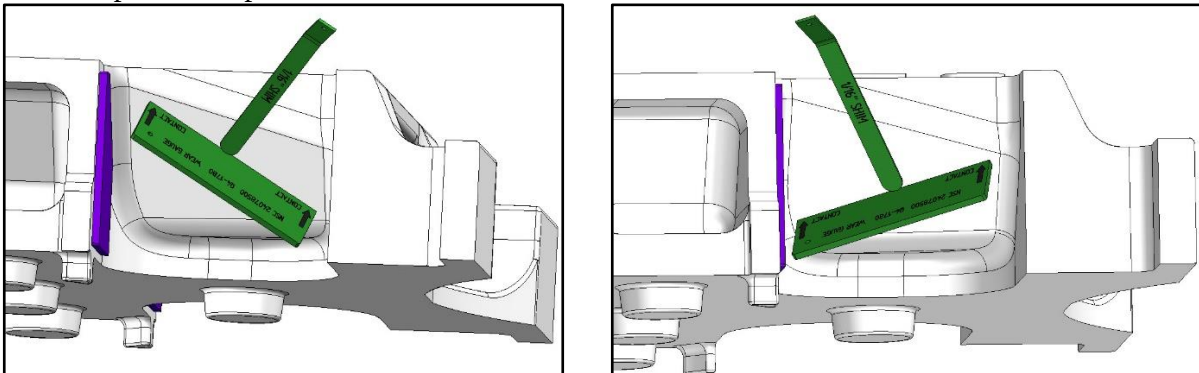


Figure 19: Bolster Pocket Spacing Wear Gauge Application (Q4-1780)

If any repairs are done to the pocket slope face, apply gauges Q4-1760, Q4-1770, and Q4-1780 to check the repaired bolster pocket. Apply both sides of gauge Q4-1760 to inspect the primary angle of the bolster wedge pocket. For each side of the gauge, one contact face must be able to rest on the pocket slope face while flush with the spring seat area. The gauge should be applied across the approximate center of the pocket slope face (Figure 20).

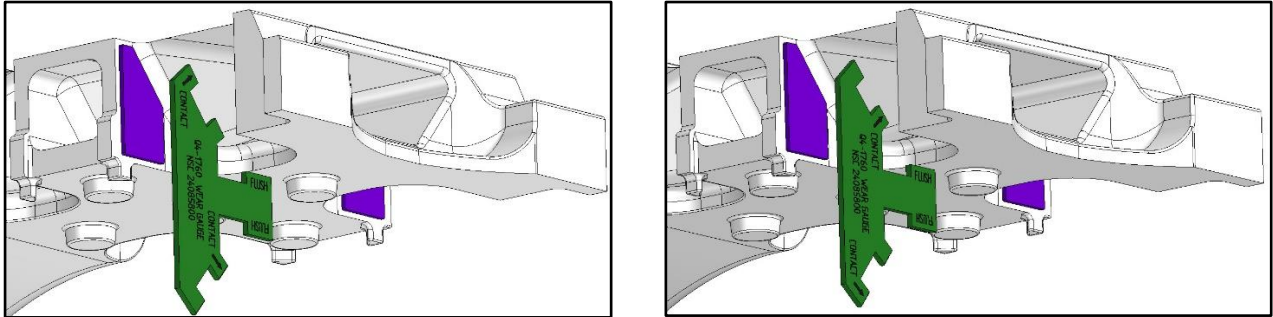


Figure 20: Bolster Pocket Primary Angle Gauge Application (Q4-1760)

Apply both sides of gauge Q4-1770 to inspect the secondary angle of the bolster wedge pocket. For each side of the gauge one contact face must be able to rest on the pocket slope face, while flush with the pocket side wall without the wear liner. The gauge should be applied across the approximate center of the pocket slope face (Figure 21).

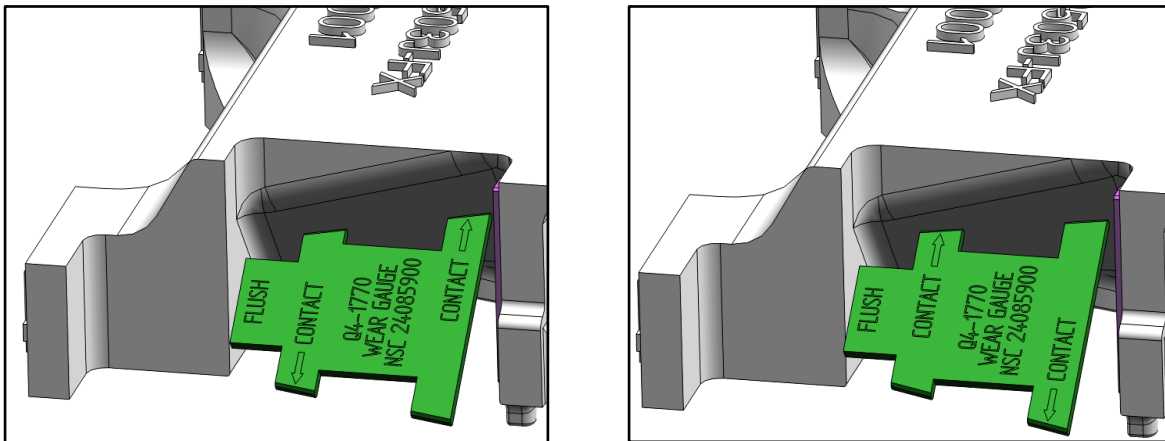


Figure 21: Bolster Wedge Pocket Secondary Angle Gauge Application (Q4-1770)

5.2.2. Wedge Pocket Side Wall Wear Plate

Side wall wear plates of the wedge pocket (Figure 22) are to be inspected any time the wedges are disassembled from the truck. If any section of the wear plate has worn down to a thickness of 1/16" or less, the wear plate must be replaced.

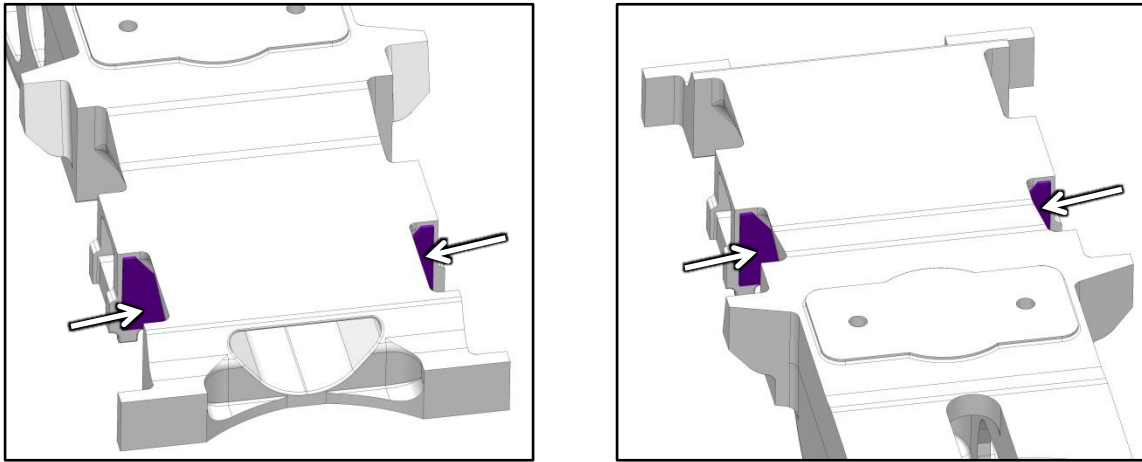


Figure 22: Bolster Side Wall Pocket Wear Plates

To reapply a side wall wear plate, follow the welding procedure outlined in Figure 23. The wear plates are to be replaced with in kind parts. The worn side wall wear plates are to be removed by cutting the welds attaching them to the bolster. Take care not to gouge the bolster during the cutting. Grind the weld remaining inside the pocket so that the pocket walls are smooth. Do not remove base material from the pocket by over-grinding. Ensure the wedge pocket is free of any spatter.

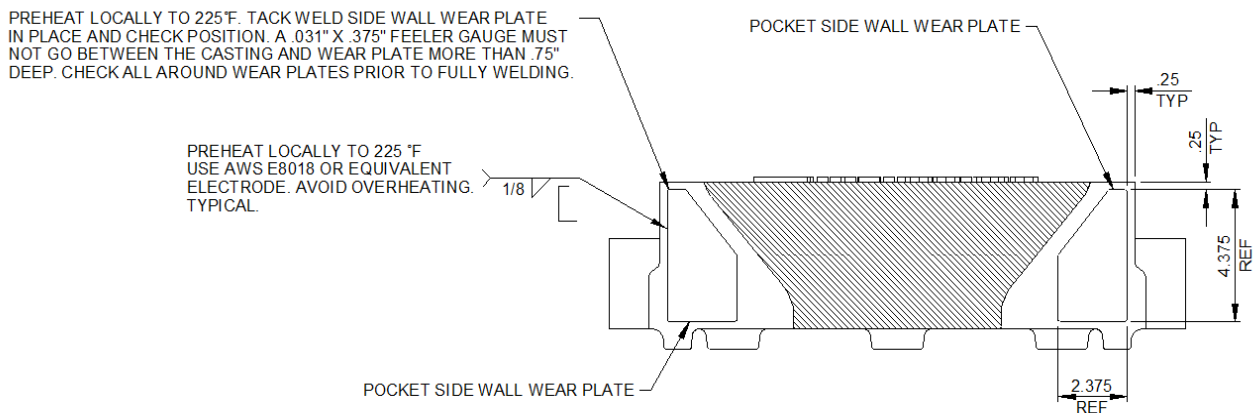


Figure 23: Bolster Pocket Side Wall Wear Plate Application

5.2.3. Longitudinal Stops

The longitudinal stop surfaces on the bolster may also wear if they are contacting with the column wear plates on the side frame. There are four (4) longitudinal stop surfaces on each end of the bolster indicated by the arrows in Figure 24.

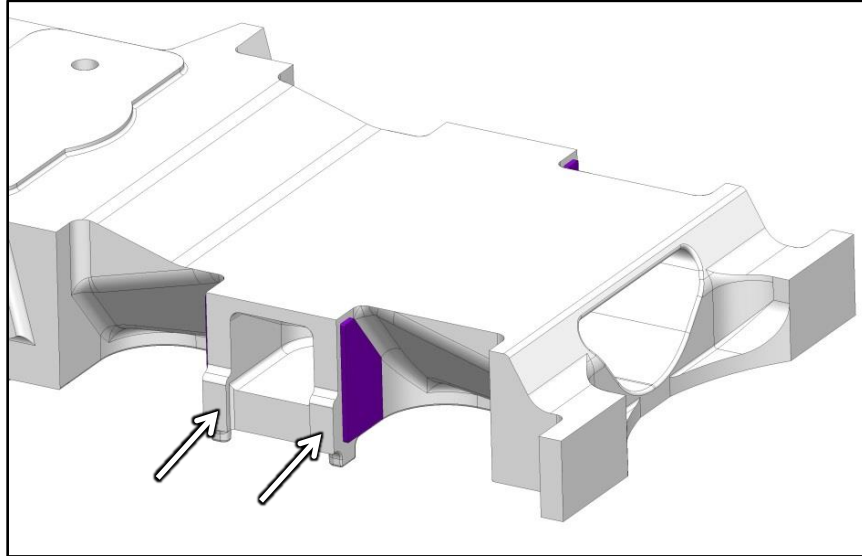


Figure 24: Bolster Longitudinal Stop Wearing Surfaces

The wear level can be checked by measuring the distance across the stops on each side by the use of gauge Q4-1700 (Figure 25). The side of the gauge labelled “contact” must touch one of the longitudinal stops, while the Go/No-Go side will be at the opposite longitudinal stop (Figure 26 and Figure 27). If the No-Go portion of the gauge is able to pass over the stops, then they should be repaired by weld build-up and ground flush. Unless the surfaces are showing unequal amounts of wear, apply equal amounts of weld to both longitudinal stops. Reapply the gauge after any repairs are made to ensure the Go side of the gauge still passes.

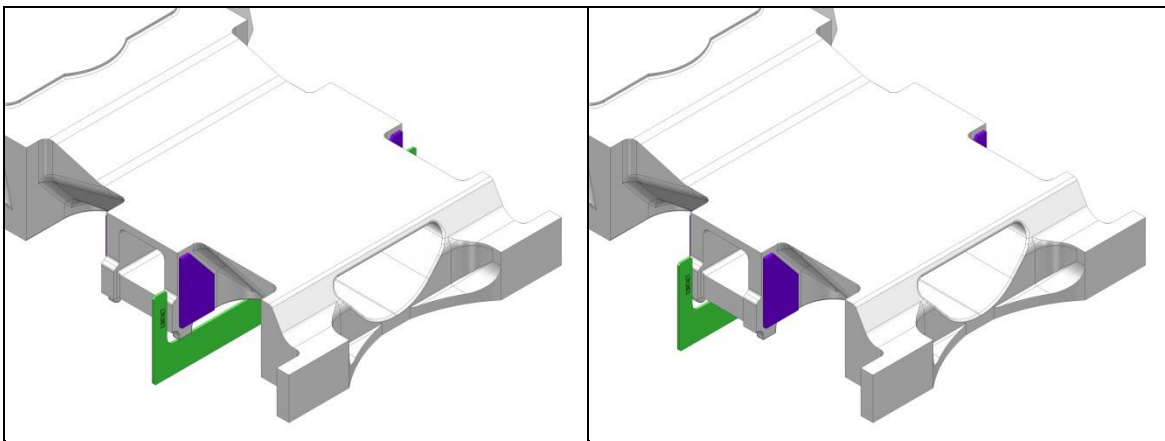


Figure 25: Bolster Longitudinal Stop Wear Gauge Application Outboard (left) and Inboard (right) (Q4-1700)

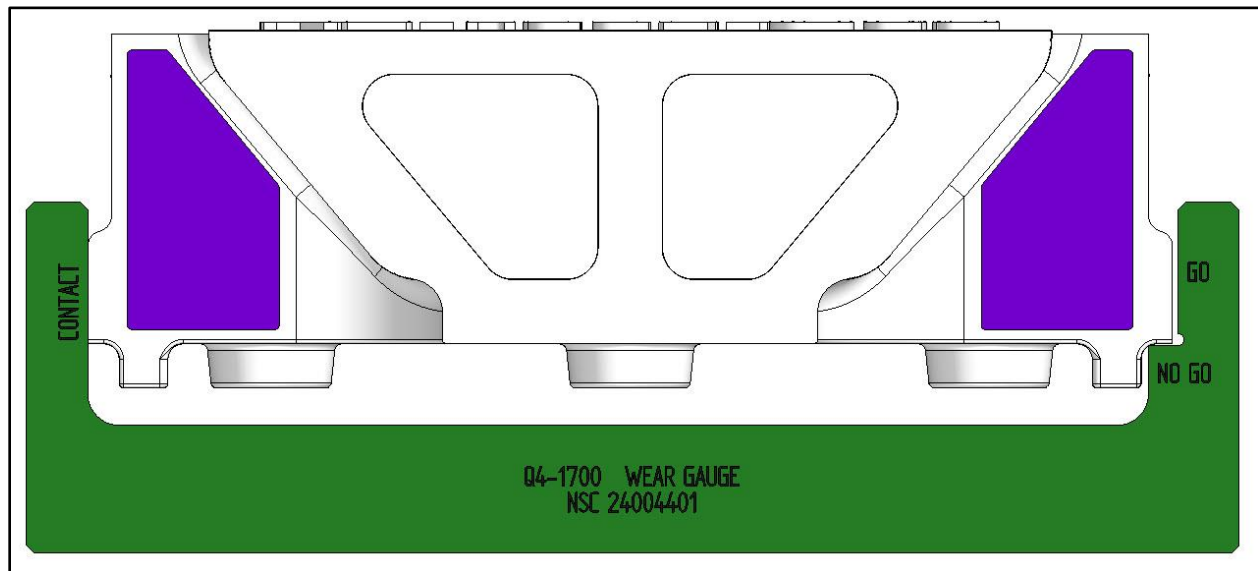


Figure 26: Bolster Longitudinal Stop Wear Gauge, Pass Condition (Q4-1700)

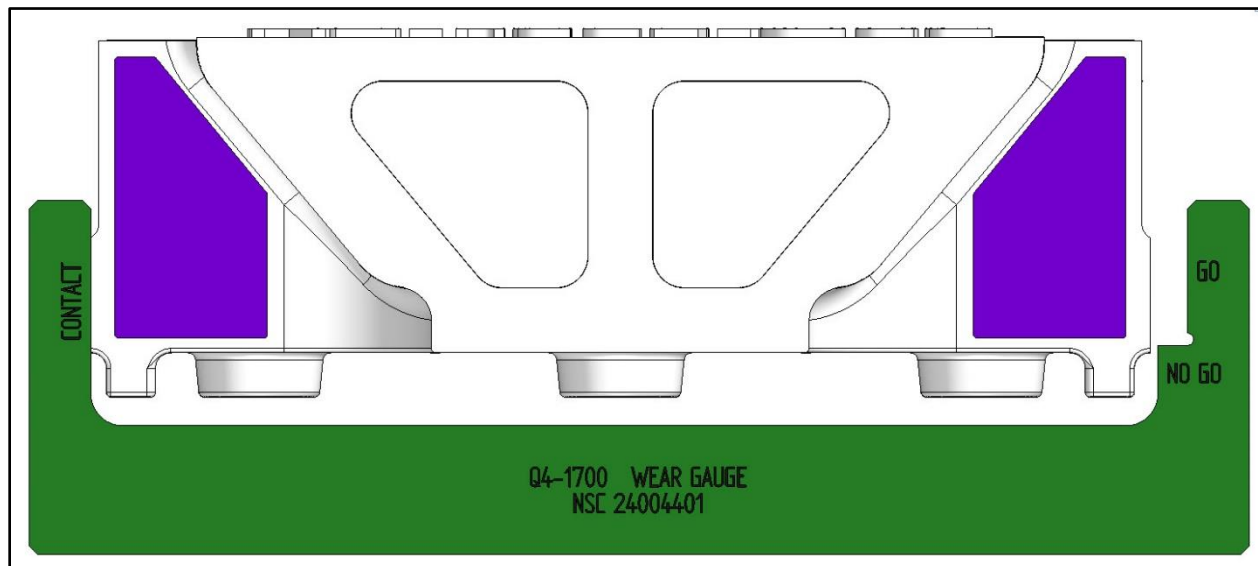


Figure 27: Bolster Longitudinal Stop Wear Gauge, Repair Indicated (Q4-1700)

5.2.4. Bolster Gibs

To check the wear on the bolster gibs, use a wire brush to remove any debris and surface contamination and apply gauge Q4-1710 between the gibs (Figure 28 and Figure 29). The gauge must contact the inside face of the outboard gib, rest on top of the bolster at the inboard gib, and pass up to the longitudinal stops. If the No-Go side of the gauge is able to fit between the gibs with a gap of $5/16''$ or less while contacting the top of the bolster, then the bolster must be repaired. If the gap between the No-Go side of the gauge and the gibs is greater than $5/16''$, the bolster must be replaced. If a repair is indicated, first check for wear on the outboard gib. If the thickness of the outboard gib is less than $3/4''$, repair by weld build up and grind flush to achieve a thickness of $7/8''$. Then repair the inboard gib by weld build-up and grind flush. The Go side of the gauge must be able to fit between the gibs after any repairs are performed (Figure 30, Figure 31, and Figure 32).

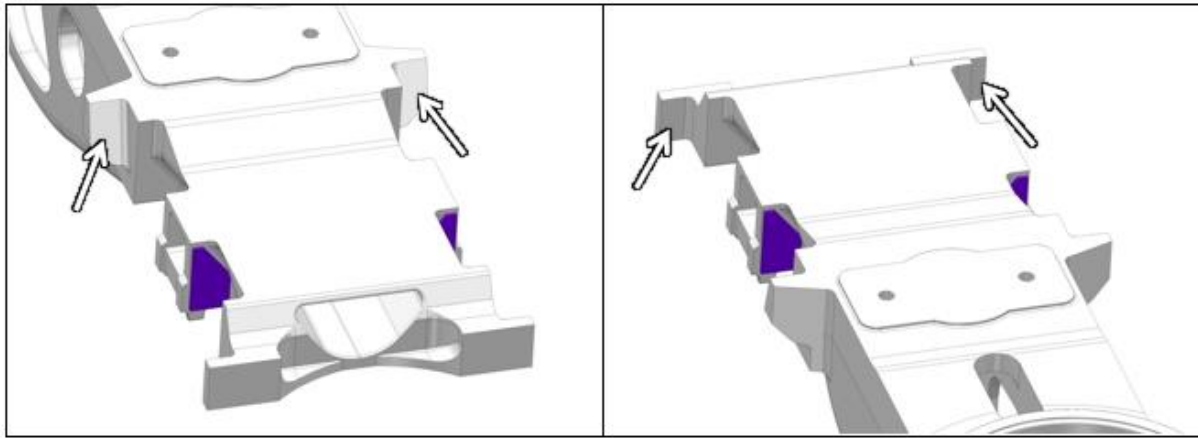


Figure 28: Bolster Inboard (left) and Outboard (right) Gib Surfaces

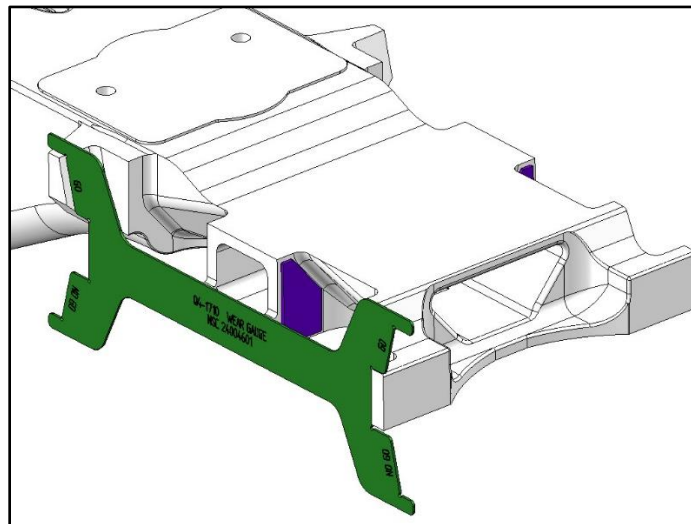


Figure 29: Bolster Gib Wear Gauge Application (Q4-1710)

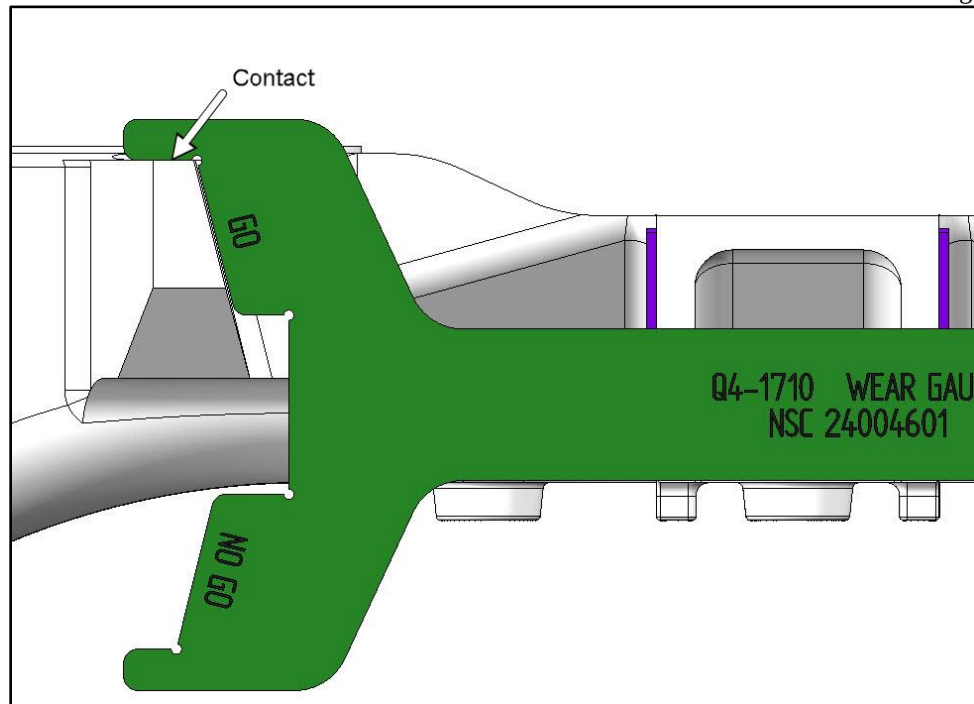


Figure 30: Bolster Gib Wear Gauge, Go Side Pass Condition (Q4-1710)

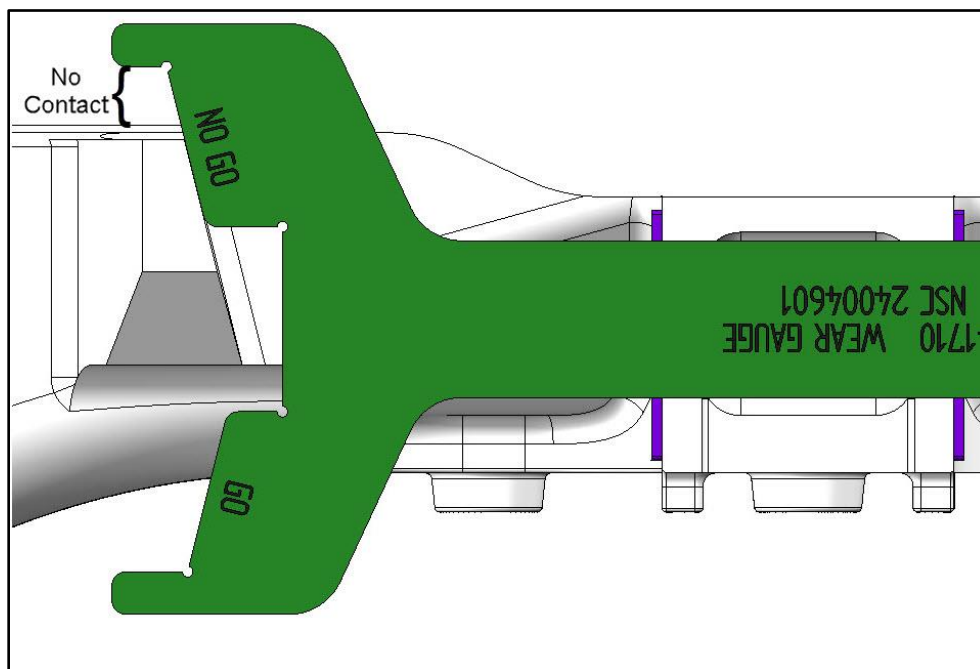


Figure 31: Bolster Gib Wear Gauge, No-Go Side Pass Condition (Q4-1710)

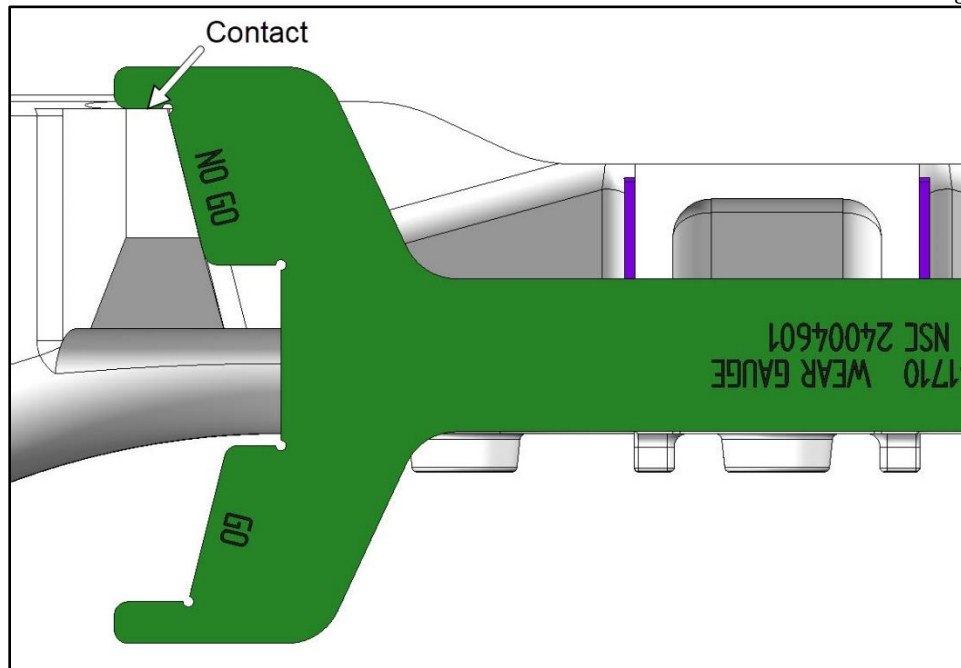


Figure 32: Bolster Gib Wear Gauge, No-Go Side Repair Indicated (Q4-1710)

5.2.5. Center Bowl Wear Liners

The vertical and horizontal wear liners are of a standard design and can be inspected and replaced as per AAR Field Manual Rule 47. The reapplication of the wear liners must be done as per AAR Standard S-308.

5.3. Wedge

5.3.1. Wedge Slope Face

Any time the wedge is removed from the truck, the wedge slope face should be checked for wear by applying wear gauge Q4-1730 to the wedge. Use a wire brush to remove any debris and surface contamination from the slope face and place the gauge at the approximate center of the visible wear patch, where the wear will be at a maximum (Figure 33). The circular cut out of the gauge ideally has to rock or fit over the slope face (Figure 34). If there is a gap between the slope face and the gauge (Figure 35), apply a 3/64" thick x 1/2" wide No-Go shim. If the shim fits, the wedge is to be replaced. Then rotate the gauge 90° as shown in Figure 33, and repeat the same check.

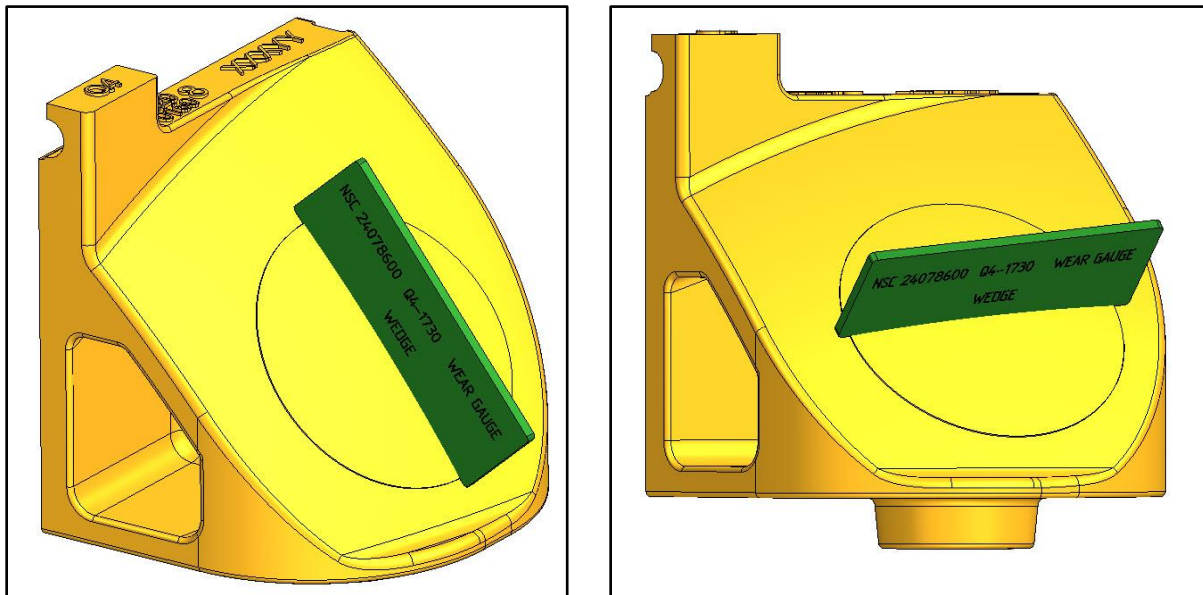


Figure 33: Wedge Slope Face Radius Wear Gauge Application (Q4-1730)

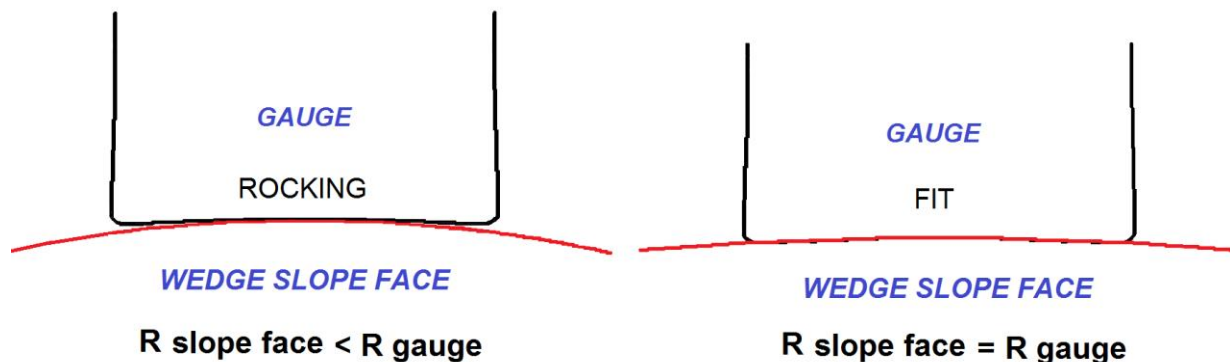


Figure 34: Wedge Wear Gauge Application; PASS: Rocks / Fits over the Wedge Surface

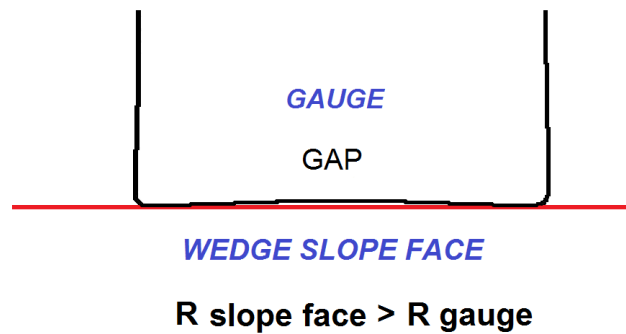


Figure 35: Wedge Wear Gauge Application; FAIL: Gap between the Gauge and the Wedge Surface Allows a 3/64" Thick x 1/2" Wide Shim to Pass

5.3.2. Wedge Side Face

The side face of the wedge may also experience some gradual wear and should be inspected at the same time as the wedge slope face. If any portion of the side face has worn to the same depth as the indicator shown in Figure 36, then the wedge is to be replaced.

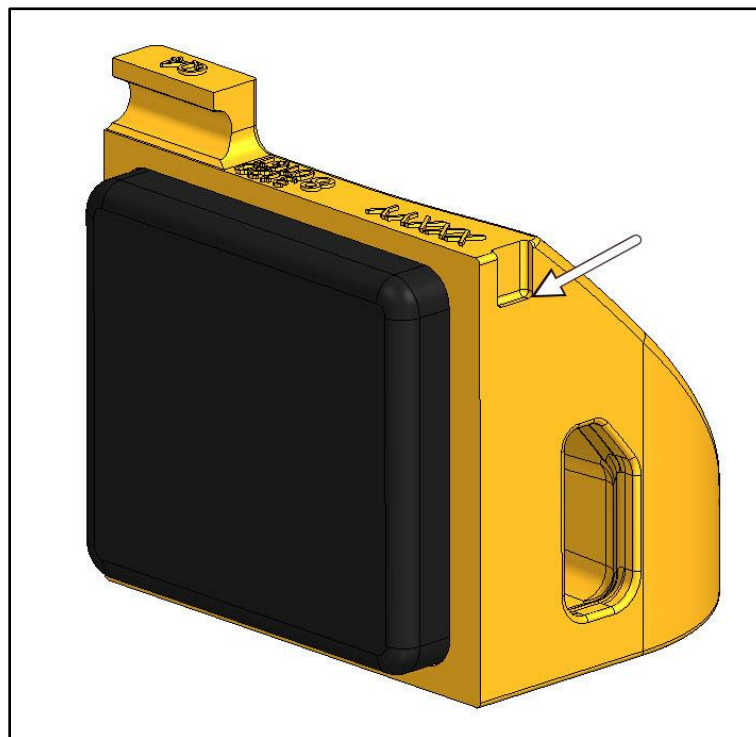


Figure 36: Wedge Wear and Rise Indicator

5.3.3. Wedge Rise

Wedge rise is indicated through the use of the visual height indicator on the inside face of the wedges (Figure 37). Check the bottom of the visual height indicator to see if it is above the top of the bolster on any wedge. If the indicator is above the top of the bolster, a fail is indicated and the wedge is to be replaced. If a height indicator is below the top of the bolster, then no further inspection is required.

If a wedge replacement is needed, then all wedges in the spring group should be removed as per the disassembly procedure. Once removed, inspect the wedges, friction pads, bolster pocket slope face, bolster pocket side wall wear plates and side frame column wear plates as indicated in the appropriate section of this manual.

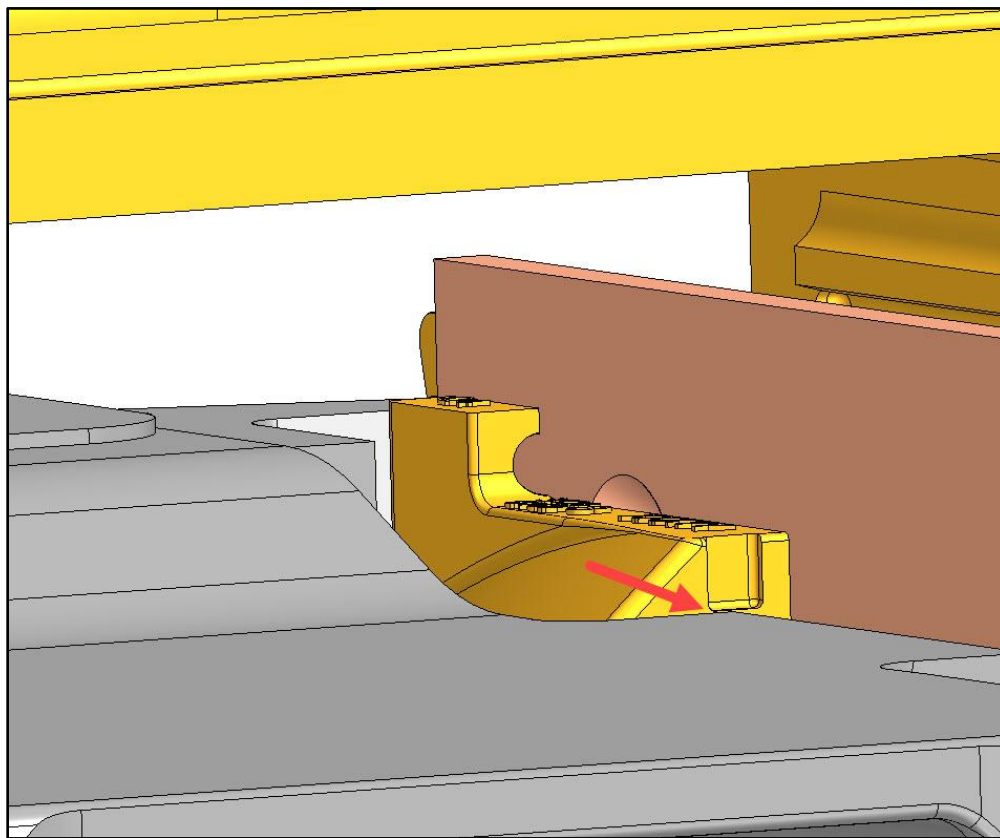


Figure 37: Wedge Visual Height Indicator Shown Flush with Top of Bolster

5.3.4. Friction Pad

The thickness of the friction pad can be visually observed without disassembling the truck (Figure 38). If the friction pad is flush, or nearly flush (less than 1/16" stick out), with the casting, the wedge assembly (wedge and pad) should be replaced at the next scheduled service interval. If the pad was worn such that the wedge casting is contacting the side frame column wear plate (steel on steel contact), then inspect the side frame column wear plate as outlined in Section 5.1.3. of this Manual.

If the wedges have been removed from the truck for any reason, it is recommended to replace the wedges if the friction pad thickness is less than 1/16" stick out.

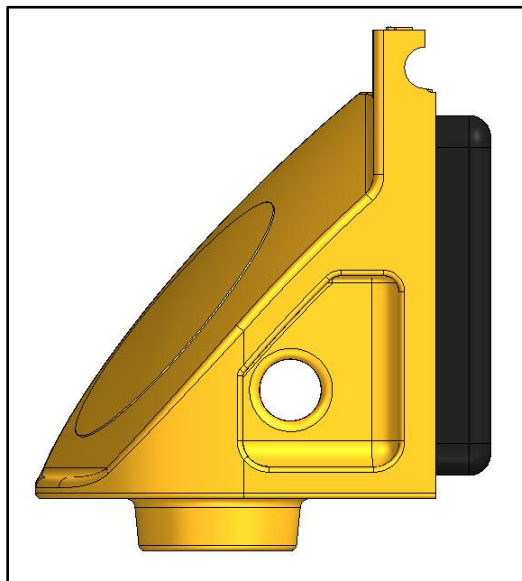


Figure 38: Friction Pad (black) Protruding from Wedge

5.4. Variable Passive Steering (VPS™) System

All areas of the Q4 bearing adapter are to be inspected and repaired as per AAR Field Manual Rule 37 and AAR Specification M-924, and by what is covered in this manual.

5.4.1. Bearing Adapter

The bearing adapter spherical crown may wear and the bearing adapter may require replacement. The small cutaway on the side of the bearing adapter (Figure 39) provides a quick visual check: if the pedestal roof contacts the edge of the cutaway, the bearing adapter and the two guides must be removed as per the disassembly procedure for further inspection.

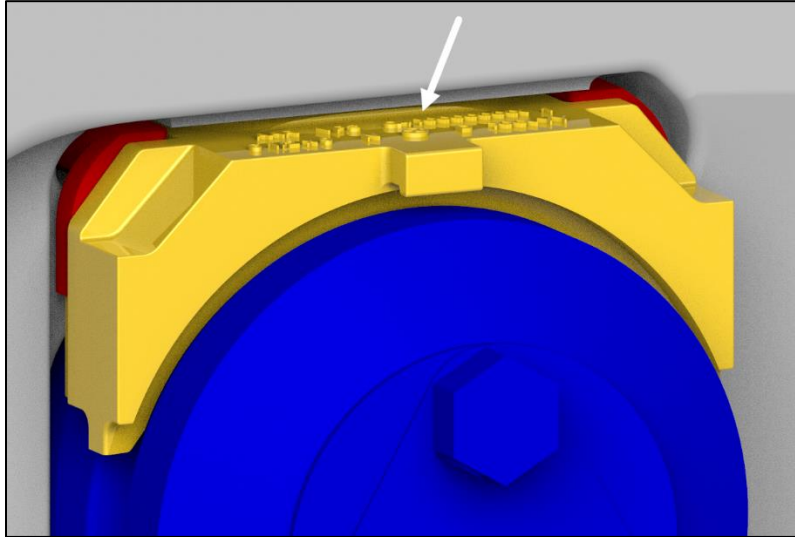


Figure 39: Bearing Adapter Crown Wear Indicator

Although the wear indicator check provides a simple indication of wear without disassembly, the crown radius of the bearing adapter can also be inspected with the bearing adapter crown wear gauge Q4-1740. Any time the bearing adapter is removed from the truck, the crown should be checked for wear using gauge Q4-1740. Use a wire brush to remove any debris and surface contamination from the crown and place the gauge at the approximate center of the visible wear patch, where the wear will be at a maximum (Figure 40). The circular cut out of the gauge ideally has to rock or fit over the crown (Figure 41). If there is a gap between the crown radius and the gauge (Figure 42), apply a 3/64" thick x 1/2" wide No-Go shim. If the shim fits, the adapter is to be replaced. Then rotate the gauge 90°, and repeat the same check. If one bearing adapter is replaced, it is recommended that the other bearing adapter for that wheelset also be replaced at the same time.

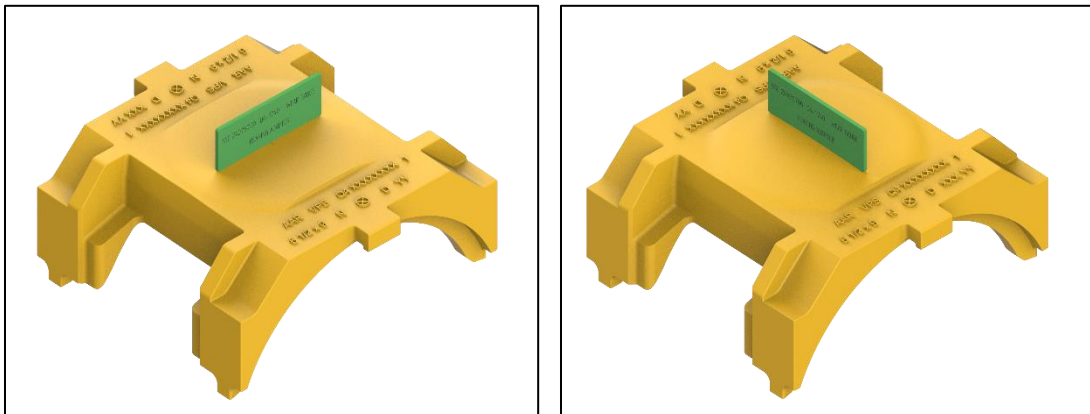


Figure 40: Crown Wear Gauge Application (Q4-1740)

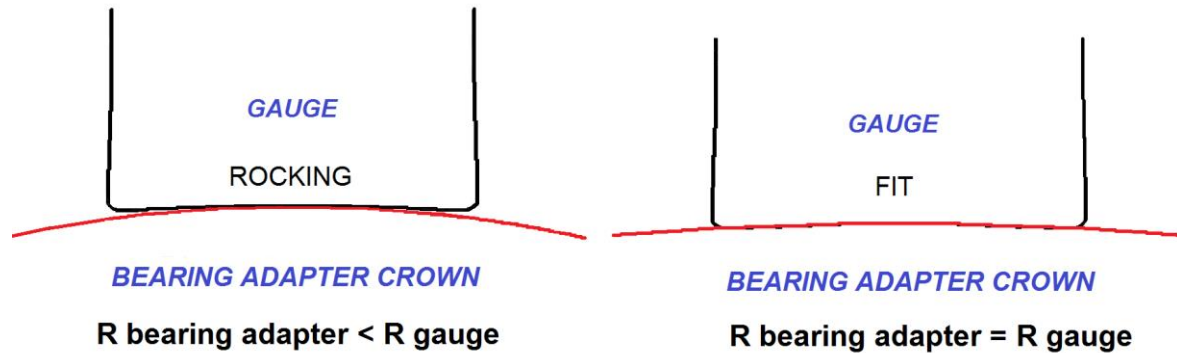


Figure 41: Crown Wear Gauge Application; PASS: Rocks / Fits over the crown

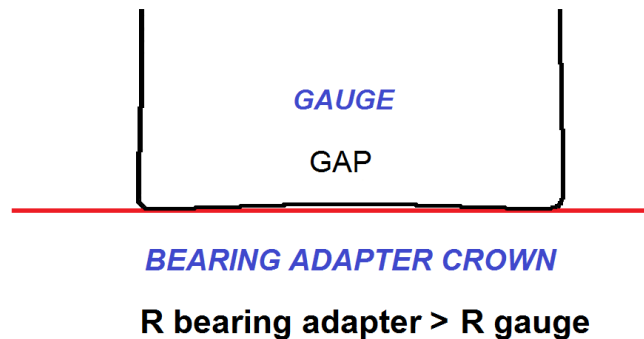


Figure 42: Crown Gauge Application; FAIL: Gap between the Gauge and the Crown that Allows a 3/64" Thick x 1/2" Wide Shim to Pass

The guide support shoulder may wear due to contact with the side frame thrust lug (Figure 43). This wear will only occur on one (1) side of the adapter. If the wear exceeds 1/8" in depth the adapter may be rotated 180° and re-installed. If any given side (inboard or outboard locations) have wear greater than 1/4", the adapter shall be replaced.

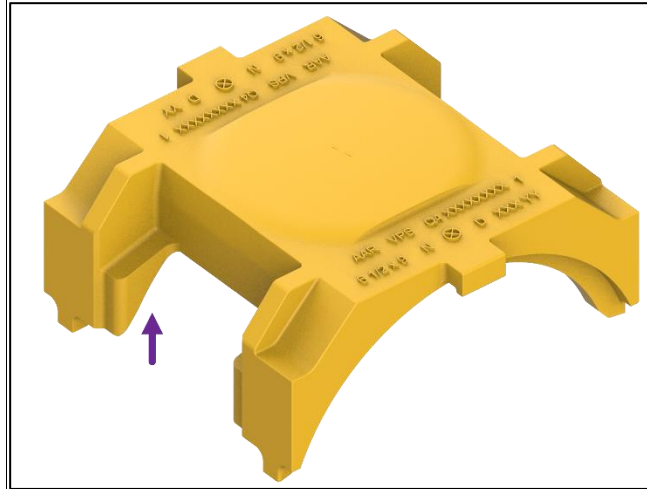


Figure 43: Guide Support Shoulder

5.4.2. Guides

The guides must be present in an assembled truck, one on each side of the bearing adapter (Figure 44). The guides can be removed by following the disassembly procedure. They can then be visually inspected as per the requirements of AAR Field Manual Rule 37. It is recommended to replace the guides whenever the associated bearing adapter is being replaced.

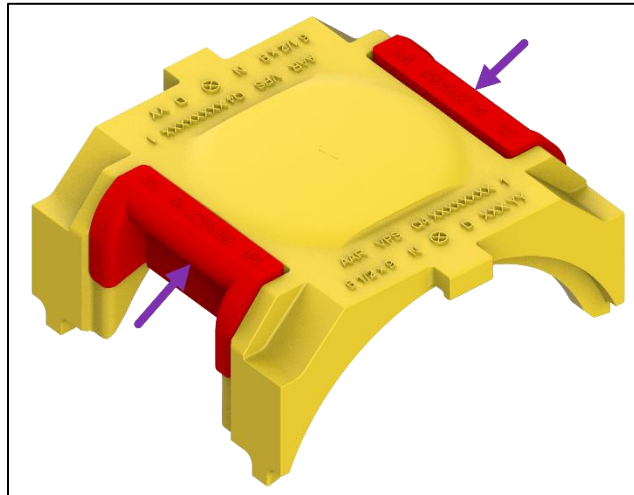


Figure 44: Guides on the Q4 Bearing Adapter

The guide works in compression between the adapter and side frame thrust lug. The compressive forces may cause the guide to take on a permanent set or develop cracks. If there is permanent set greater than 3/32", it is recommended that the guide be replaced. If there are any cracks through the thickness of the guide, it shall be replaced, such as the guide shown in Figure 45. Note that if only one side of the guide has been damaged beyond the condemning limit, the guide can be reused by rotating it such that the good side is oriented to the inboard side of the side frame pedestal.



Figure 45: Cracked Guide

5.5. Miscellaneous

5.5.1. Fasteners

All fastener repairs must be done in accordance with AAR Field Manual Rule 74. The Q4 truck uses specific fasteners for the Q4 side frame column wear plate, and must be replaced in kind. Reference Table 1 and Figure 46 for the part information for the fasteners used.

Table 1: Fastener Descriptions

Part Number	Description	Drive
70211600	Bolt, 3/4"-10 x 2-3/8" AudiTORX Flat Head CAMCAR TEXTRON, Part 788-74090-945	External Torx
70207500	Flange Lock Nut, 3/4"-10 TORX CAMCAR TEXTRON, Part 788-74110-000	TORX



Figure 46: Bolt and Nut for Q4 Truck

5.5.2. Springs

The Q4 spring group can be found in AAR Standard S-3007 as well as Section 3.1 of this manual. The standard springs can be inspected and repaired as per AAR Field Manual Rule 50. The stabilizer springs in the Q4 truck are to be inspected with the criteria in Table 2, and repaired as per AAR Field Manual Rule 50. The stabilizer springs should be replaced when the free height of the spring measures less than the scrap height.

Table 2: Stabilizer Spring Condemning Limits

Spring Number	Outer Diameter	New Height ($\pm 1/4$ ")	Scrap Height
B-353	4 7/8"	11 3/16"	10 5/8"
B-354	3 1/8"	11 1/2"	10 59/64"

5.5.3. Side Bearings

The Q4 truck side bearings can be inspected and repaired as per AAR Field Manual Rule 62. Consult the side bearing supplier for any additional information. Any replacement of side bearings must be of like parts in order to achieve the proper preload requirements and optimum truck performance.

6. Frequency of Q4™ Truck Inspections

6.1. Visual Inspection of Assembled Q4™ Truck

When a car equipped with Q4 trucks is in a shop or on a repair track, the trucks should be visually inspected according to the instructions provided in Section 3.3 of this Manual as well as the AAR Field Manual.

6.2. Teardown Inspection of Q4™ Truck

When a Q4 truck is disassembled it should be inspected according to the instructions provided in Section 5 of this Manual and to AAR Requirements.

7. Appendix

7.1. References

The following is a list of applicable AAR regulations covering topics discussed within this manual. These include, but are not limited to:

- AAR Field Manual Rule 37, Roller Bearing Adapters
- AAR Field Manual Rule 46, Truck System Performance
- AAR Field Manual Rule 47, Truck Bolsters
- AAR Field Manual Rule 48, Truck Side Frames
- AAR Field Manual Rule 50, Truck Springs
- AAR Field Manual Rule 62, Truck Side Bearings
- AAR Field Manual Rule 74, Securement
- AAR MSRP Section D, Standard S-308, Center Plate Liner – Vertical, 6 1/2" x 12"
- AAR MSRP Section D, Standard S-335, Spring – D5, 3 11/16-in. Travel
- AAR MSRP Section D, Standard S-336, Spring – D6, 3 3/8-in. Travel
- AAR MSRP Section D, Standard S-337, Spring – D6A, 3 5/16-in. Travel
- AAR MSRP Section D, Standard S-3016, Spring – Groups for Free, Unrestricted Interchange for 286,000 GRL Cars (M-976 Approved Trucks)
- AAR MSRP Section H, Specification M-924, Journal Roller Bearing Adapters
- AAR MSRP Section J, Specification M-1003, Quality Assurance
- AAR MSRP Section S, Specification M-214, Classification and Repair Procedures
- AAR MSRP Section S-II, Standard S-327, Side Frame – Roof Repair

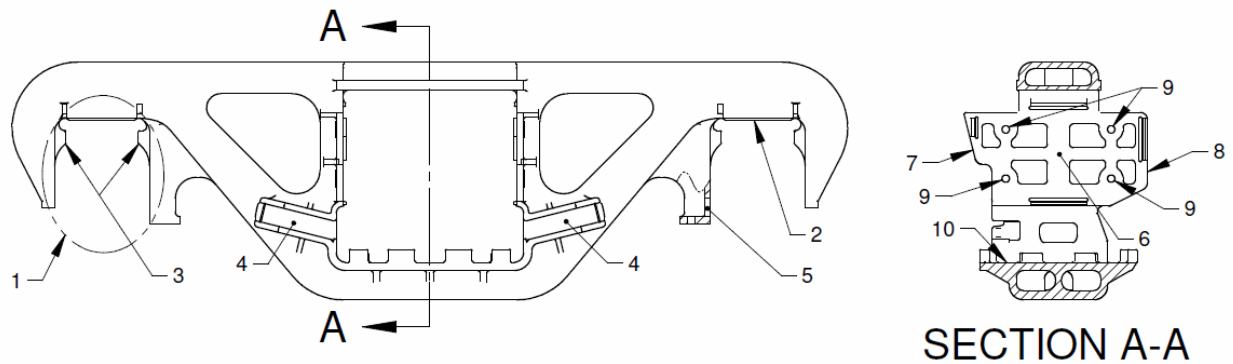
If there are any questions regarding this manual or applicable AAR rules, please contact Q4 support at Support@Q4TechnologiesInc.com.

7.2. List of Q4™ Truck Components

Q4 110 Ton Component	Part Number	Part Number (Previous)
Bolster (including welded wear plates, no Dead Lever Fulcrum Bracket)	70918955	41000000
Bolster Pocket Side Wall Wear Plate	70919600	23912400
Bolster Dead Lever Fulcrum Bracket, Left Hand	70778550	70778550
Bolster Dead Lever Fulcrum Bracket, Right Hand	70778551	70778551
Side Frame (with bolted column wear plates)	70919255	41000001
Side Frame Column Wear Plate	70855515	23812902
Bearing Adapter, 6-1/2 x 9, CL K	70919455	31111301
Guide, Bearing Adapter	70919800	22934917
Friction Wedge Assembly, Left Hand (with wear pad)	70920485	23812683
Friction Wedge Assembly, Right Hand (with wear pad)	70920486	23812684
Bolt, 3/4"-10 x 2-3/8" AudiTORX Flat Head	70211600	70211600
Flange Lock Nut, 3/4"-10 TORX	70207500	70207500
D5 Outer Spring	70238949	70238949
D6 Inner Spring	70456500	70456500
D6A Inner-Inner Spring	70276100	70276100
B-353 Outer Stabilizing Spring	70020001	70020001
B-354 Inner Stabilizing Spring	70020101	70020101

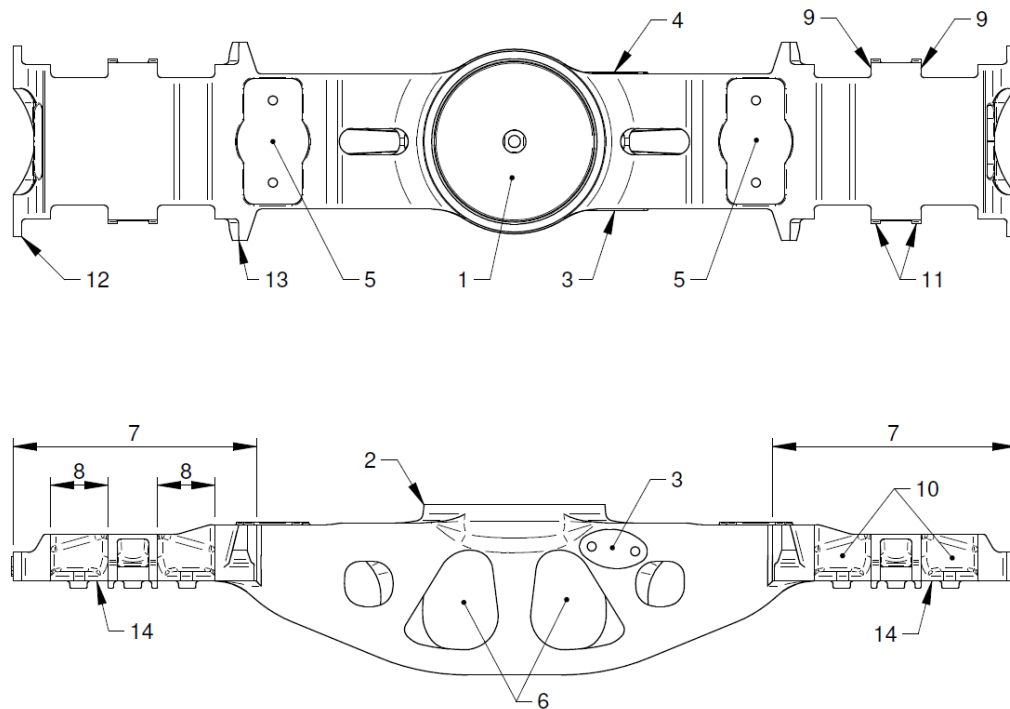
If possible, please supply the side frame or bolster 9 digit AAR code number and casting pattern number, when ordering replacement components.

7.3. Side Frame Nomenclature



1	Side Frame Jaw
2	Pedestal Roof
3	Pedestal Thrust Lugs
4	Unit Guide Brake Beam Pockets
5	Retainer Key Slot
6	Column Face
7	Inboard Column Guide
8	Outboard Column Guide
9	Wear Plate Retainer Holes
10	Side Frame Spring Seat

7.4. Bolster Nomenclature



1	Bolster Center Bowl
2	Bolster Center Plate Rim
3	Dead Lever Fulcrum Bracket Pad Right Hand
4	Dead Lever Fulcrum Bracket Pad Left Hand
5	Side Bearing Pads
6	Brake Rod Holes
7	Bolster End Section
8	Bolster Pocket
9	Pocket Side Wall
10	Pocket Slope Face
11	Longitudinal Stops
12	Outboard Gib
13	Inboard Gib
14	Bolster Spring Seat

7.5. Q4™ Truck Gauges

Table 3 lists the Q4 truck gauges to be used in the repair and maintenance procedures. The Q4 specific gauges (Gauge Numbers starting with Q4) can be ordered by contacting Q4 Support at Support@Q4TechnologiesInc.com. It is the responsibility of the repair facility to properly maintain and calibrate these gauges.

Table 3: Q4 Gauges for Repair and Maintenance

Q4-110 ton Truck Wear Gauges			
Gauge Number	Type of Gauge	Gauge Description	Comments
Bolster			
EC 1109	AAR-Production	As-cast center bowl "Go" gauge for truck bolster	Use as is
EC 1126	AAR-Production	Center bowl "Go" gauge for truck bolster center bowl wear liners	Use as is
EC 1110	AAR-Production	As-cast center bowl "No-Go" gauge for truck bolster	Use as is
EC 1127	AAR-Production	Center bowl "No-Go" gauge for truck bolster vertical ring wear liners	Use as is
Q4-1700	Q4-Wear	Distance between stops wear gauge	Custom Gauge - 24004401
Q4-1710	Q4-Wear	Bolster gib wear gauge	Custom Gauge 24004601
Q4-1760	Q4-Wear	Bolster pocket primary angle wear gauge	Custom Gauge 24085800
Q4-1770	Q4-Wear	Bolster wedge pocket secondary angle wear gauge	Custom Gauge 24085900
Q4-1780	Q4 – Wear	Bolster pocket wear gauge	Custom Gauge 24078585
Side Frame			
EC 1107-1	AAR-Production	Wheel base gauge for side frame	Use as is
EC 1107-2	AAR-Production	Enlarged view of scale on wheel base gauge	Use as is
EC 1090-2	AAR-Production	Application of key slot gauge and journal roof to key slot gauge	Not Applicable
EC 1200	AAR-Wear	Side frame pedestal roof wear limits gauge	Use a 1/16" x 1/2" shim with straight edge
EC 1157	AAR-Wear	Pedestal roof to key slot gauge	Not Applicable
Q4-1210	Q4-Production	Column "Go" gauge for side frames	Custom Gauge - 23962400
Wedge			
Q4-1730	Q4-Wear	Wedge radius	Custom Gauge - 24078600
Bearing Adapter			
Q4-1740	Q4-Wear	Crown wear	Custom Gauge - 24078700
AM-45092	AAR-Production	Bore diameter	See AAR M-924, Appendix C
Adapter Wear Gauge	AAR-Wear	Thrust shoulder wear	See AAR Field Manual, Rule 37